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Identification of the La6F37 cubooctahedral clusters in mixed crystals (BaF2)1 - X (LaF3) x by the electron paramagnetic resonance method

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Abstract

The electron paramagnetic resonance (EPR) spectra of mixed crystals (BaF2)1 - x (LaF3) x (x = 0, 0.001, 0.002, 0.005, 0.010, 0.020) doped with Ce3+ ions (0.1%) are investigated at a frequency v ≈ 9.5 GHz in magnetic fields up to 1.45 T at temperatures T = 10 and 15 K. The EPR spectrum of "pure" barium fluoride BaF2 (x = 0) is characterized by a single Ce 3+-F- center with tetragonal symmetry (i.e., the O center with g || = 2.601 and g ⊥ = 1.555). For a lanthanum trifluoride concentration x 0, the spectrum exhibits new lines due to the presence of the clusters containing Ce3+ and La3+ ions. The intensity of EPR signals from the O centers decreases rapidly as the lanthanum trifluoride concentration x increases. The lines attributed to a paramagnetic center with tetragonal symmetry and strongly anisotropic g factors (i.e., the K center with g || = 0.725 and g ⊥ = 2.52) are separated in the complex EPR spectrum with the use of the angular dependence of the EPR signal intensity measured for the samples with x > 0.002. This center is identified as a cubooctahedral cluster of the La 6F37 type in which one of the La3+ ions is replaced by the Ce3+ ion. © 2007 Pleiades Publishing, Ltd.

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